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ABSTRACT

Adult listeners have the ability to identify spoken samples of a language that they do not know and to discriminate among languages. In order to accomplish these tasks, listeners attend to rhythm, pitch excursions, and segmental properties of language samples. That is, they create simple representations of phonology. This study examined the effects of previous experience with languages on the ability to arrive at simple phonological representations. Three groups of American college student listeners participated in the study: 17 in their third year of Spanish study (a phonetically similar language to the target Japanese), 20 monolinguals without any significant experience studying foreign languages, and 17 in their third year of German study (a phonetically distant language from the target Japanese). All listeners were tested the same way. First, they watched a brief Japanese cartoon. Then, they heard a test recording containing samples of five foreign languages. For each sample, the listeners had to decide whether the language was Japanese or not. In general, the three groups performed differently on the task. The monolingual students had the most difficulty separating Japanese from the other four languages. The German-studying students had the least difficulty. Although none of the listeners had specific experience with Japanese, they approached the task of representing novel phonology in ways that may have been influenced by their experiences with sound patterns of other languages. (Contains 15 references.) (Author/KFT)

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LANGUAGE EXPERIENCE AND THE REPRESENTATION OF PHONOLOGY IN AN UNKNOWN LANGUAGE

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LANGUAGE EXPERIENCE AND THE REPRESENTATION OF PHONOLOGY IN AN UNKNOWN LANGUAGE

ABSTRACT

Adult listeners have the ability to identify spoken samples of a language that they do not know (Bond, Stockmal and Muljani 1998, Lorch and Meara 1995) and to discriminate among languages even when produced by the same talker (Stockmal, Bond and Moates in press). In order to accomplish these tasks, listeners attend to rhythm, pitch excursions and segmental properties of language samples. That is, they create simple representations of phonology. This study examines the effects of previous experience with languages on the ability to arrive at simple phonological representations (see Marks, Bond and Stockmal 1999). Three groups of listeners participated in the study: 17 American college students in their third year of study of Spanish (a phonetically similar language to the target Japanese), 20 monolingual American college students without any significant experience studying foreign languages, 17 American college students in their third year of study of German (a phonetically distant language from the target Japanese).

All listeners were tested in the same way. First, they watched a brief Japanese cartoon. Then they heard a test recording containing samples of five foreign languages. For each sample, the listeners had to decide whether the language was Japanese or not.

In general, the three groups performed differently on the task. The monolingual students had the most difficulty separating Japanese form the other four languages. Although none of the listeners had specific experience with the target language, they approached the task of representing novel phonology in ways which may have been influenced by their experience with the sound patterns of other languages.

INTRODUCTION

After adult listeners have heard brief spoken samples of a foreign language, they are able to identify new samples of the same language or to discriminate it from other languages. Listener judgements must be based on the phonetic characteristics of languages because these judgements can be made without grammatical or semantic knowledge.

The abilities of adult listeners to identify foreign languages under some conditions have been well documented by studies including Lorch and Meara (1989), Lorch and Meara (1995), Bond and Fokes (1991), and Bond and Stockmal (2000), among others. However, very few studies have examined the learning responsible for language identification. Muthusamy, Jain and Cole (1994) reported on two experiments. In the first experiment, listeners received training with 40 excerpts from 10 languages and then were presented with new excerpts from the languages varying in duration from one to six seconds. Listeners received feedback about their judgement on every trial. The second experiment increased the number of trials and included listeners whose first languages were used in the test. In Experiment 1, listener performance did not change appreciably, but adding more trials in the second experiment lead to improved performance. Listeners could identify familiar European languages (French, German, Spanish) better than less familiar languages. They were basing their judgements on multiple sources of information, i.e. specific words which could identify a language, easily perceived segments which would be characteristic of a language, and prosodic features. In their multi-dimensional scaling (MSD) investigation of same-different judgements about foreign languages, Stockmal, Muljani and Bond (1996) found very similar listener strategies. Pitch inflections, characteristic of both Chinese and Japanese led listeners to judge these two languages as similar. Arabic and Russian were also judged as similar but on the basis of rhythmic pattern. Spanish was unique in being

identified from familiar words and was also judged similar to Indonesian on the basis of rhythmic pattern. In a series of three experiments, Bond, Stockmal and Muljani (1998) investigated changes in listener ability to identify a language after brief periods of exposure and the efficacy of two different types of listening materials: word lists (which provide information about the segmental and syllabic structure of the language) and a story (which also includes information about sentence prosody). This study showed that listeners consistently found Chinese and Indonesian to be more similar to Japanese than either Arabic or Russian. This finding suggests that the listeners were attending to prosodic information such as rhythmic pattern and pitch contour. The listeners could reject Arabic and Russian as different from Japanese on the basis of stress-timed rhythmic structure and the other phonetic properties associated with stress-based rhythm. In contrast, Indonesian, a syllable-timed language, shares rhythmic properties with mora-timed Japanese. Noticeable pitch excursions may have been the basis for confusions of Chinese with Japanese. Marks, Bond and Stockmal (1999) investigated the effects of proficiency in a specific foreign language on the ability to identify a novel foreign language and whether monolingual and bilingual listeners attend to different properties. This study showed that bilingual English-Spanish listeners outperformed monolingual English listeners in the task of identifying Japanese as a novel language. Proficiency in Spanish might have helped American English listeners rely on the vowel system, phonotactics, syllable structure or rhythmical information to identify Japanese correctly. This finding suggests that language proximity in terms of phonetic properties may play an important role.

From previous investigations, we can conclude that listeners attend to rhythm, pitch patterns, and segmentals as well as speaker and voice characteristics (Esling and Wong 1983; Bond and Stockmal 2000). We also know that language proximity may play a significant part in

the identification of a novel language. However, as noted by Marks, Bond and Stockmal (1999), it is unclear whether the proximity effect is a language specific effect. The present study is concerned with: 1) The effects of previous experience with languages on the ability to arrive at simple phonological representations; and 2) The properties to which listeners exposed to a phonetically distant foreign language from the target language attend.

METHOD

Materials. The exposure material consisted of a Japanese cartoon which lasted for approximately 10 minutes. The test materials employed 30 different spoken samples from five languages. Ten samples were Japanese, produced by two talkers from Tokyo. The other 20 samples, five from each language, were provided by one female native speaker of Arabic, (Mandarin) Chinese, Indonesian and Russian, respectively. All language samples were complete phrases produced at a normal rate for that language. On the test recording, the samples were presented in random order. Arabic and Russian were included in the test because both are said to employ stress rhythm with relatively complex phonemic inventories, including consonants which are not found in Japanese (Maddieson 1984). Indonesian and Chinese represent Asian languages. Chinese has been found to be confused with Japanese in previous studies, probably on the basis of pitch excursion (Muthusamy et al. 1994, Stockmal 1995, Bond, Stockmal and Muljani 1998), even though it has a different consonant inventory and may employ stress rhythm rather than the syllable (or mora) rhythm of Japanese (Hung 1996). The consonant inventory of Indonesian is a sub-set of the Japanese consonant inventory (Maddieson 1984) and to native speakers, the language appears to be syllable- rather than stress-timed (like Spanish, for example).

Listeners. Three groups of listeners participated in the study. The first group was composed of 29 American college students in their third year of Spanish study and relatively proficient in this language (SP learners). The second group consisted of 17 American college students in their third year of German study and relatively proficient in this language (GE learners). Finally, in the third group we recruited 20 monolingual American college students from an introduction to hearing and speech sciences course. These students had no formal contact with or exposure to Spanish or German and had not studied a foreign language. For the purpose of our study, this group served as our control group. All the listeners had self-reported normal speech and hearing and voluntarily participated in the study.

Procedure. All three groups of listeners were tested in their respective classrooms using the same procedure. First, listeners watched a Japanese cartoon which lasted for approximately 10 minutes. After the period of exposure, the listeners heard the test recording which contained brief samples of five languages, namely, Arabic, Chinese, Indonesian, Japanese and Russian. They were instructed to judge each language sample as either Japanese or not Japanese. Listeners recorded their answers on a prepared answer sheet.

RESULTS

Specific correct identification of Japanese. In order to examine the correct identification of Japanese, we conducted a one-way ANOVA using proportion of correct responses as scores for

correct identification of Japanese. The results, in Figure 1, indicated that both groups, the SP learners and the GE learners, correctly identified Japanese 76% to 81% of the time. In contrast, the control group was only approximately 64% correct in identifying the target language.

[Figure 1]

All the groups differed significantly [$F(2, 63) = 3.954$, $p=.024$]. Tukey HSD posttest revealed that the control group was significantly different from the other two at the task of identifying Japanese. The GE learners showed significance ($p=.28$) whereas in the SP learners there is a trend towards significance ($p=.076$).

In this sense, the SP learners and the GE learners behaved similarly and differently from the control group. These results point to the direction that proficiency in a second language may be exerting an effect on the listeners' ability to identify a novel foreign language.

Overall correct language identification and confusion patterns. In order to investigate the confusion patterns, we conducted a mixed-model MANOVA using the proportion of correct responses to languages as the dependent variable. Language was the within factor and group was the between factor.

Figure 2 shows that listeners almost never confused Arabic or Russian with Japanese, correctly rejecting these languages approximately 95% of the time. Chinese was equally confusing for all three groups of listeners. The SP learners were better than the monolingual listeners at correctly rejecting Indonesian but the GE learners were significantly better than both the SP learners and the monolingual listeners.

[Figure 2]

The interaction between group and language condition was not significant. However, both the groups and the languages were significantly different from each other [$F(2, 63) = 4.092$, $p=.021$]. Tukey HSD posttest revealed that Japanese and Russian were significant, Arabic and Indonesian showed a trend towards significance but Chinese was not significant.

DISCUSSION

This study raises some issues concerning the effects of second language proficiency in the ability to identify a novel foreign language, on the one hand, and also the language properties to which the listeners were attending while performing the task of identifying the target language.

Specific identifications of Japanese were different for proficient foreign language listeners (the SP learners and the GE learners) and monolingual listeners (the control group). Japanese was correctly identified by the SP learners and the GE learners while the monolingual listeners in the control group faced more difficulties. We speculate that the reason why the proficient foreign language listeners performed so well is to do with the fact that proficiency in a foreign language helps listeners develop certain plasticity towards the phonetic properties of unfamiliar languages. In various experimental situations, listeners have shown considerable sensitivity to the sound or acoustic signature of languages, they have been sensitive to their phonetic pattern and therefore have been able to form mental representations. It is not a purely perceptual ability but rather one which is cognitive in nature.

From their confusion patterns, it is evident that in general the listeners found Chinese and Indonesian to be more similar to Japanese than either Arabic or Russian. As discussed by Bond et al. (1998), this finding suggests that the listeners were attending either to prosodic information

such as rhythmic pattern and pitch contour. Although Arabic and Russian differ from Japanese in segment inventory as well as in rhythmic patterns, the segmental differences may not have been particularly salient to the listeners. As Best et al. (1988) have argued, listeners do not find all segmental differences in foreign languages equally salient. Rather, listeners assimilate some non-native segments to native language segments. The listeners could reject Russian and Arabic as different from Japanese on the basis of the phonetic properties associated with stress-based rhythm (Dauer, 1983; Bertineto, 1989). In contrast, Indonesian, a syllable-timed language, shares rhythmic properties with mora-timed Japanese.

Confusion patterns of Chinese with Japanese were very similar for all groups of subjects, whether monolingual or proficient in a foreign language. Although Chinese may be classified as stress-timed, its prosodic patterns are characterized by lexical tone, phonetically realized as changes in fundamental frequency within syllables. Japanese uses pitch accent rather than lexical tone. Listeners may have identified Chinese as Japanese on the basis of noticeable pitch excursions.

Confusion patterns of Indonesian with Japanese were different for all groups of subjects. Indonesian may be classified as syllable-timed and, thus, listeners may perceive it as similar to mora-timed Japanese. Similarity in terms of rhythm and vowel inventory seemed to have helped Spanish listeners in Marks, Bond and Stockmal's (1999) study in the task of identifying a phonetically similar novel foreign language, such as Japanese. However, these properties seem to have played a negative effect in helping the Spanish proficient listeners differentiate between two phonetically similar languages, Indonesian and Japanese, in this case. They failed to key into any particularly salient features, such as pitch excursions. German proficient listeners, on the other hand, did considerably better than both the monolingual listeners and the Spanish listeners.

There is a trend towards significance in their performance (p=. 052). We speculate that phonetic distance may be aiding German proficient listeners correctly identify both Indonesian and Japanese (completely different from stress-timed German).

CONCLUSION

Our findings are tentative but there are strong trends. Experienced foreign language listeners have an advantage over monolingual listeners in the sense that they are sensitized to the phonetic structure of languages and can easily form mental representations. Therefore they are bound to outperform monolingual listeners at the task of identifying a novel foreign language.

However, the specific properties that learners attend to are still under investigation. Phonetic similarity emerged as a factor in Marks, Bond and Stockmal's (1999) study. Phonetic similarity as vowel resemblances (similar inventories) and rhythmical properties (syllable-timed like languages) helped both Spanish learners and native Spanish listeners identify Japanese but it did not particularly helped these listeners correctly reject Indonesian. Both Indonesian and Japanese are considered phonetically similar to Spanish. What is a plausible explanation for this finding? Maybe pitch excursion was a salient feature that helped listeners identify Japanese. Maybe Indonesian was just too similar and thus more tedious to tell apart. The question was whether this similarity/distance was language specific or rather a universal trait.

We set out to answer this question by using listeners from a phonetically distant language to both Indonesian and Japanese, such as stress-timed German. Our findings seem to indicate that phonetic similarity/distance is language specific. Experienced German listeners did significantly better than experienced Spanish listeners at the task of identifying a phonetically distant

language such as Japanese. In addition, these German learners did considerably better than the Spanish learners at correctly rejecting Indonesian as a phonetically distant language.

If the phonetic properties that listeners attend to when they are asked to identify a novel foreign language are language specific, then we need to study the particular salience of properties from phonetically similar and phonetically distant languages. Are phonetically similar languages more easily identifiable? Are features from phonetically distant languages more salient than features from phonetically similar languages? How could phonetic similarity and phonetic distance be more precisely defined?

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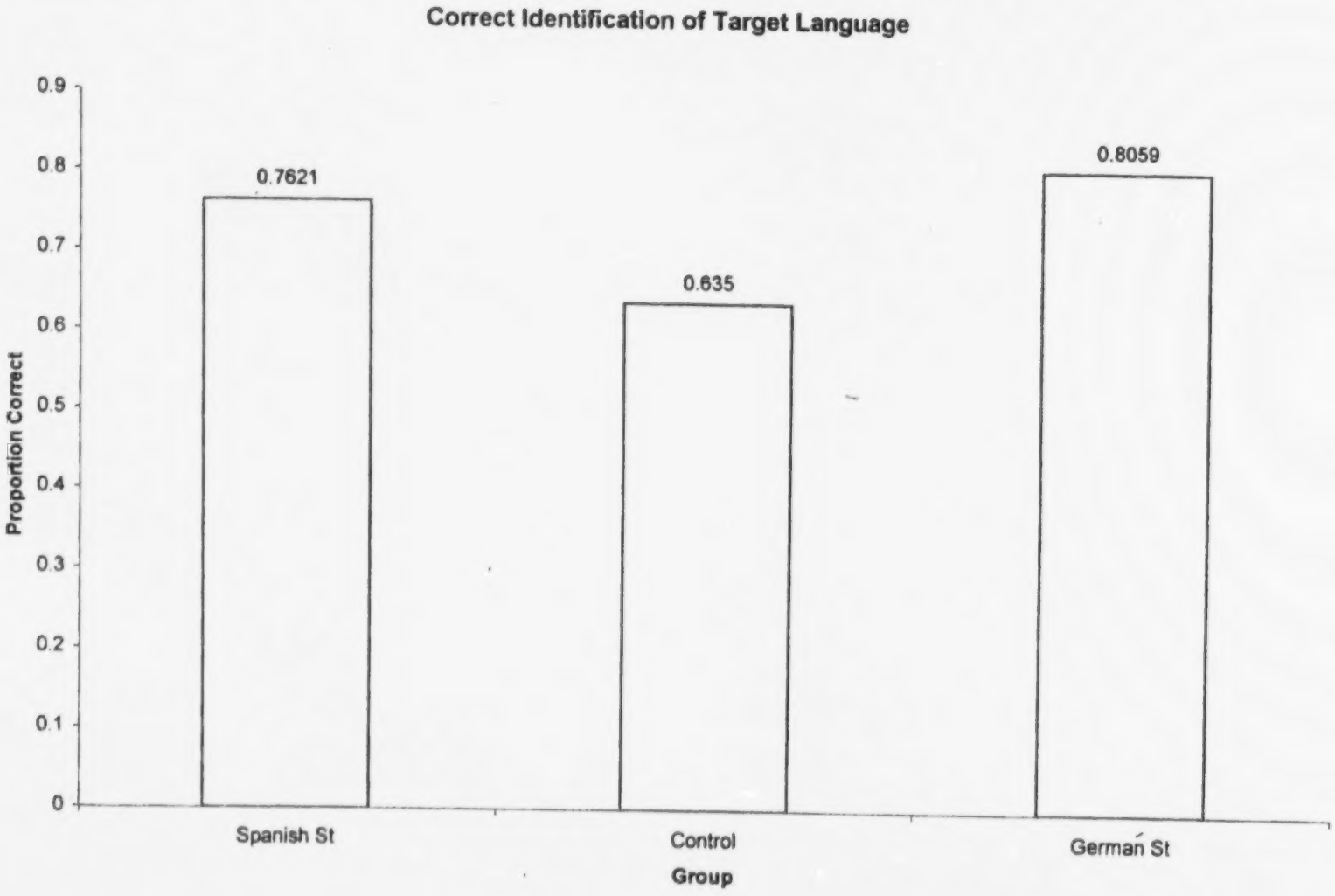
Correct Identification of Target Language
0.9
0.8
0.7
0.6
0.5
0.4
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0.2
0.1
0
Proportion Correct
0.7621
0.635
0.8059
Spanish St
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Germán St
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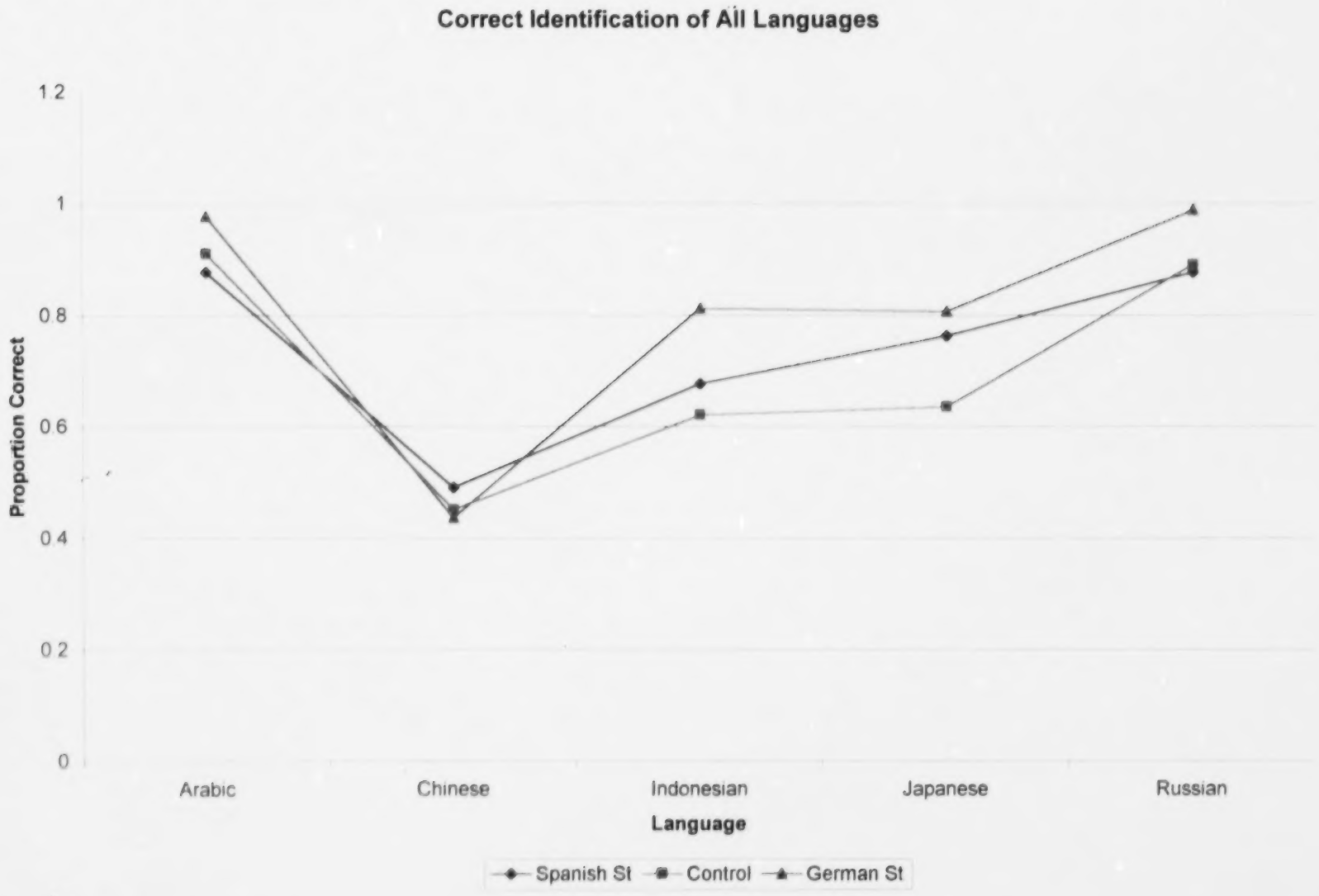
Correct Identification of All Languages
1.2
1
0.8
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Proportion Correct
Arabic
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Spanish St
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German St